

What is claimed is:

1. A bidirectional conduction superjunction device comprising a silicon substrate having a first and second laterally spaced plurality of parallel trenches extending perpendicularly into a surface of said substrate of a first conductivity type; a first end of said first plurality of trenches being laterally spaced from a first end of said second plurality of trenches by an invertible channel region; the interior surfaces of each of said trenches being of a second conductivity type; a source contact and a drain contact connected to respective second ends of said first and second plurality of trenches respectively; and a MOSgate structure connected to said invertible channel region.
2. The device of claim 1, wherein the charge of said first conductivity type of the mesa regions between said trenches is at least approximately matched by the charge of the diffusion of said second conductivity type which lines said trenches.
3. The device of claim 1, wherein said first conductivity type is P and said second conductivity type is N.
4. The device of claim 2, wherein said first conductivity type is P and said second conductivity type is N.
5. The device of claim 1, wherein said device is free of a termination.
6. The device of claim 2, wherein said device is free of a termination.
7. The device of claim 3, wherein said device is free of a termination.

8. A bidirectional conduction superjunction device comprising a substrate of the first conductivity; and a plurality of thin layers formed atop said substrate and stacked atop one another and lying in planes parallel to one another; said layers alternating in conductivity from a second conductivity type to said first conductivity type; a drain diffusion of said second conductivity type disposed adjacent to and connected to one end of each of said layers; a trench gate structure formed in said substrate and having one wall extending along the opposite ends of each of said layers; a gate oxide lining the interior of said trench gate and a conductivity gate material filling the interior of said trench; a source diffusion of said second conductivity type adjacent a second wall of said trench; and a source and drain contact connected to said source and drain diffusions respectively; whereby the application of a potential to said conductive gate material enables conduction between said source and drain electrodes.

9. The device of claim 8, wherein the total charge in each of said layers is approximately the same.

10. The device of claim 8, wherein said first conductivity is P and said second conductivity type is N.

11. The device of claim 9, wherein said first conductivity is P and said second conductivity type is N.

12. The device of claim 8, wherein each of said layers has the same thickness.

13. The device of claim 12, wherein each of said layers is about 0.75 microns thick.

14. The device of claim 15, wherein each of said layers has a concentration of about 1.5E16 impurity carriers per cm³.

15. A bidirectional superjunction device comprising a plurality of laterally extending regions of alternately opposite conductivity type; a drain region connected to one end of said laterally extending regions and a source region connected to the opposite end of said laterally extending regions; a source electrode and a drain electrode connected to said source and drain regions respectively; and a MOSgate structure coupled to said laterally extending regions and disposed between said source and drain regions and controlling conduction between said source and drain regions.

16. The device of claim 15, wherein adjacent ones of said laterally extending regions are charge balanced.

17. The device of claim 16, wherein said laterally extending regions are defined by parallel trenches in a substrate of a first conductivity type, and diffusions of the opposite conductivity type in the walls of said trenches.

18. The device of claim 16, wherein said laterally extending regions are disposed as flat layers atop the surface of a silicon substrate.

19. The device of claim 17, wherein said MOSgate structure is disposed centrally between said laterally extending trenches.

20. The device of claim 18, wherein said MOSgated structure is a gate trench disposed between one end of said laterally extending regions and said source region; said gate trench having a gate oxide liner and is filled with a conductive gate.